



US008059396B2

(12) **United States Patent**
Chen et al.

(10) **Patent No.:** **US 8,059,396 B2**
(45) **Date of Patent:** **Nov. 15, 2011**

(54) **REMOVABLE ELECTRONIC DEVICE WITH HANDLE STRUCTURE**

(75) Inventors: **Hung-Chuan Chen**, Taoyuan Hsien (TW); **Chih-Chi Wu**, Taoyuan-Hsien (TW)

(73) Assignee: **Delta Electronics, Inc.**, Taoyuan Hsien (TW)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 131 days.

(21) Appl. No.: **12/349,779**

(22) Filed: **Jan. 7, 2009**

(65) **Prior Publication Data**

US 2010/0014223 A1 Jan. 21, 2010

(30) **Foreign Application Priority Data**

Jul. 18, 2008 (TW) 97127537 A

(51) **Int. Cl.**
H05K 7/12 (2006.01)

(52) **U.S. Cl.** 361/679.37; 361/679.35; 312/223.2

(58) **Field of Classification Search** 361/679.33-679.39, 679.02, 679.01, 361/679.58; 312/223.1-223.2

See application file for complete search history.

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Primary Examiner — Jinhee Lee

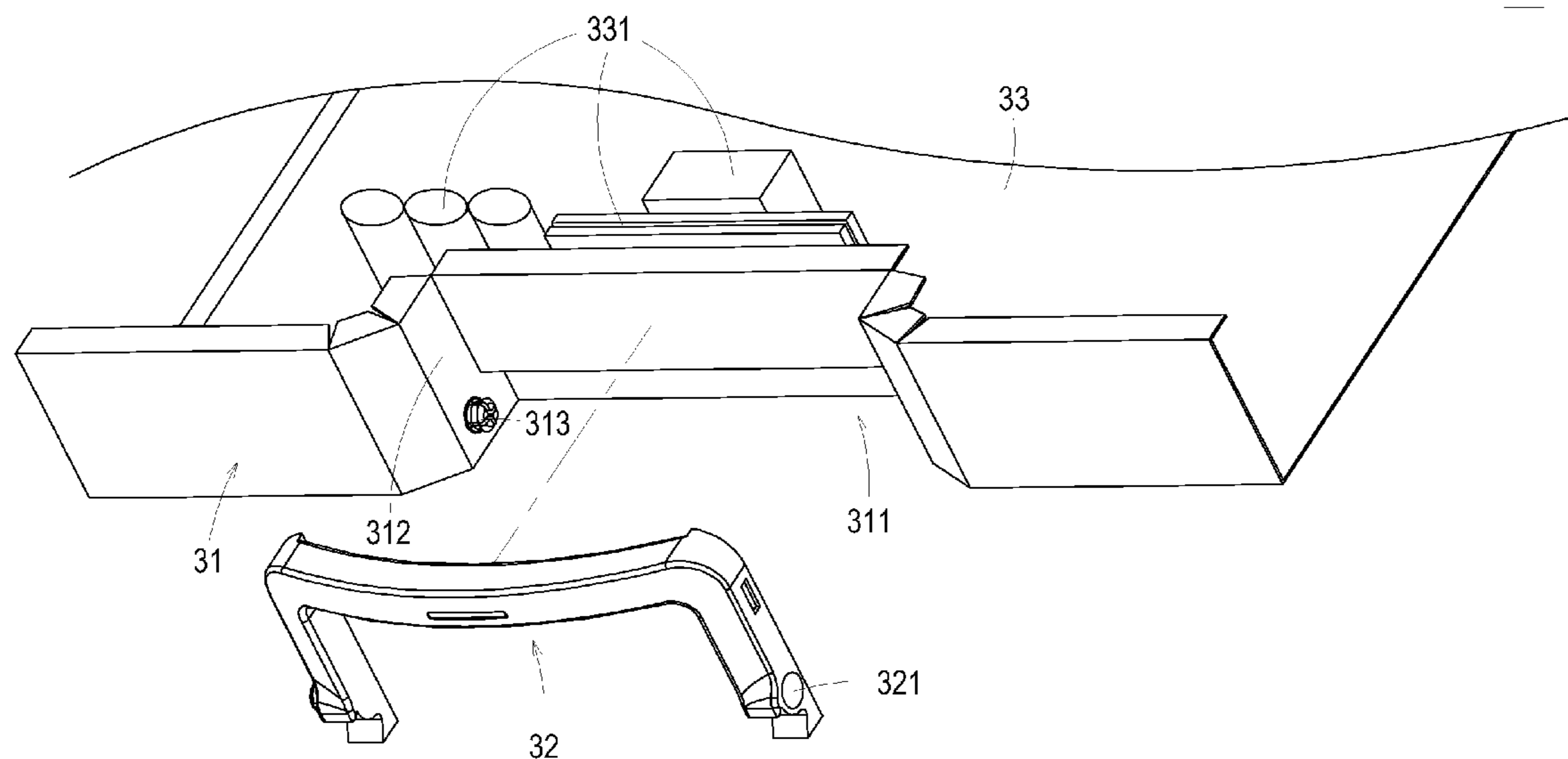
Assistant Examiner — Ingrid Wright

(74) *Attorney, Agent, or Firm* — Kirton & McConkie; Evan R. Witt

(57) **ABSTRACT**

The present invention is related to a removable electronic device with handle structure suitable for an electronic apparatus, including a housing having an accommodating trough, a handle structure, an elastic engaging device, and an engaging component corresponding to the elastic engaging device, wherein the handle structure is pivotally mounted on and received in the accommodating trough through an engagement between the elastic engaging device and the engaging component.

18 Claims, 6 Drawing Sheets



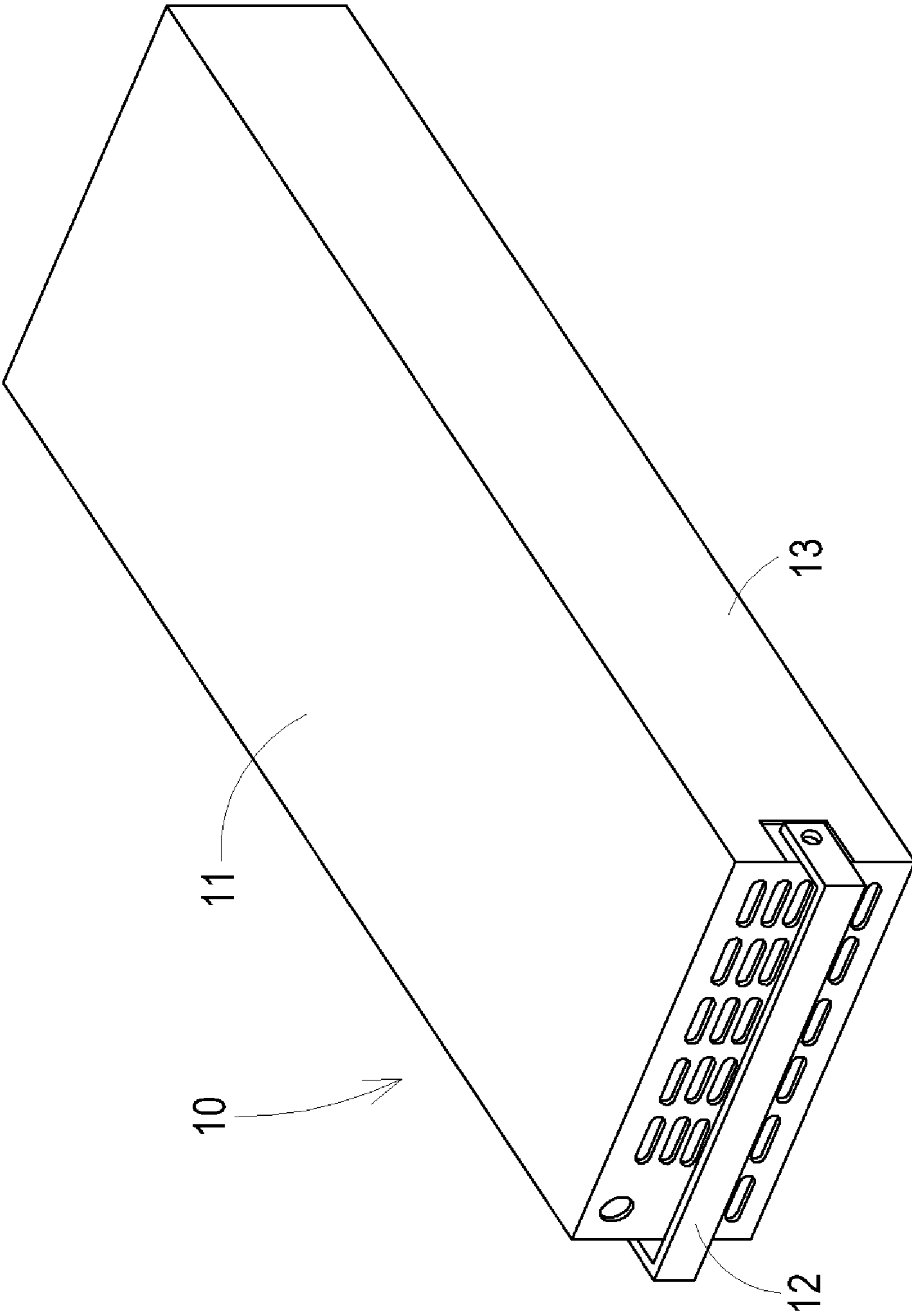


FIG. 1 PRIOR ART

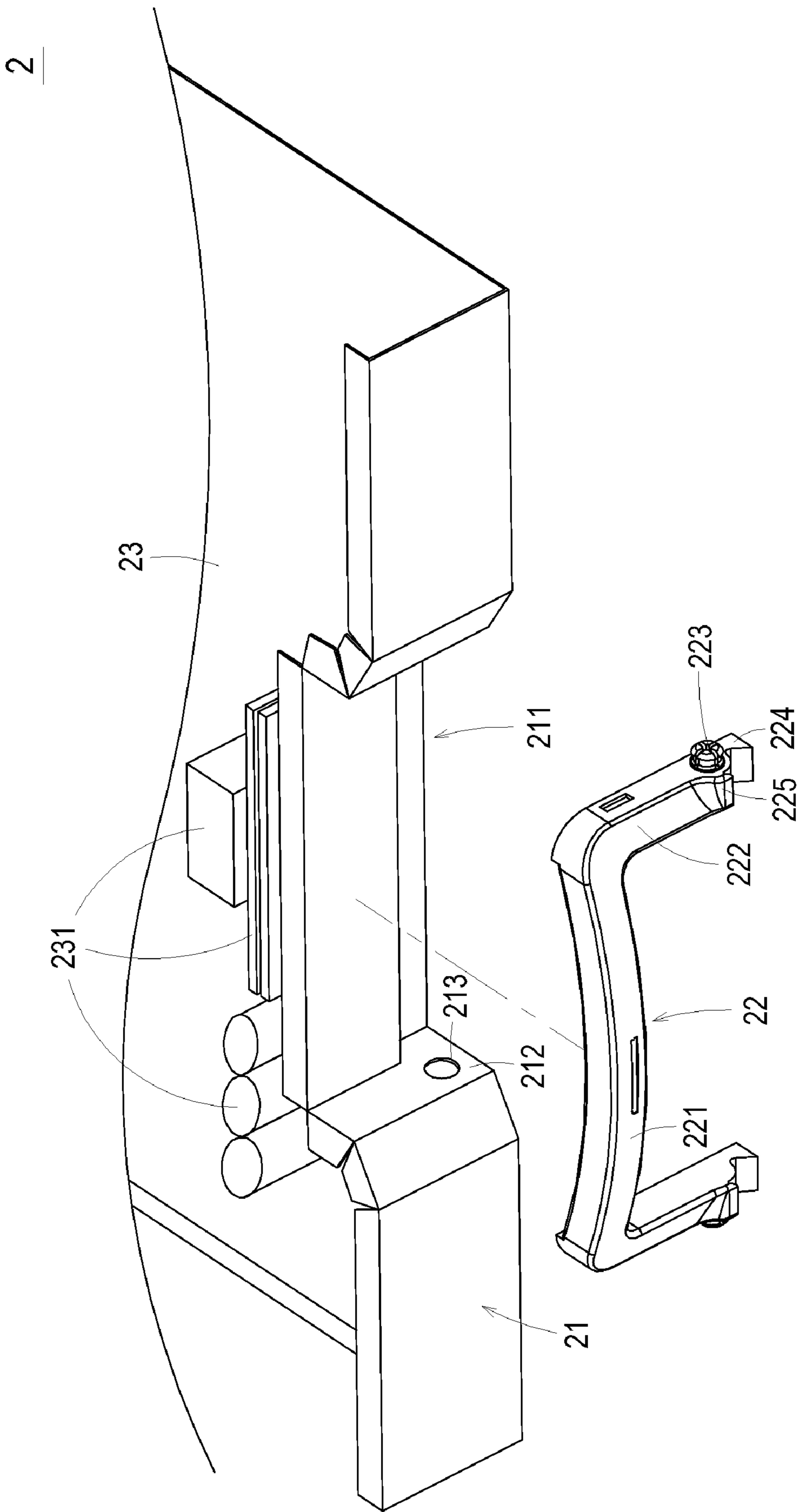


FIG. 2

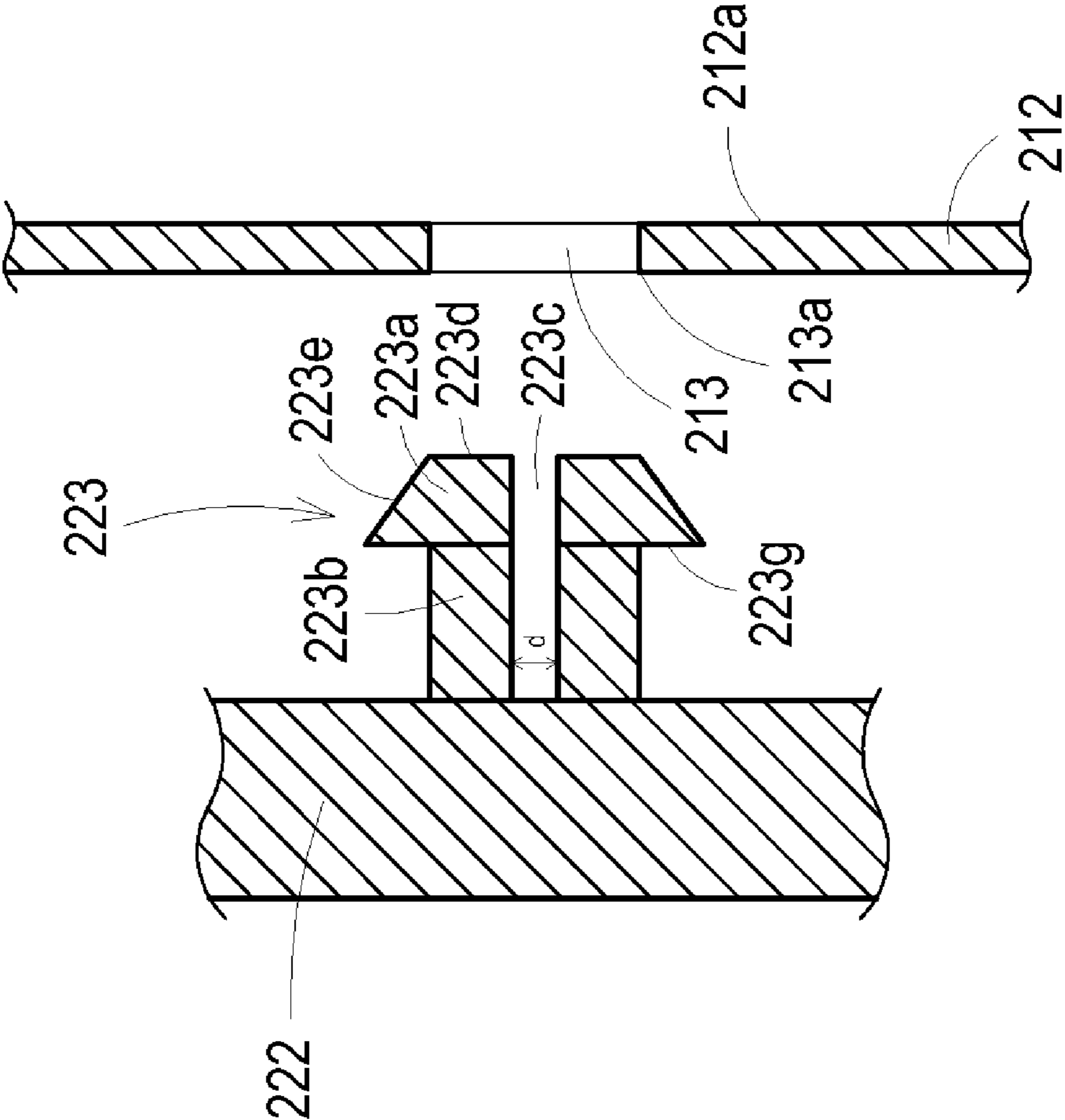


FIG. 3

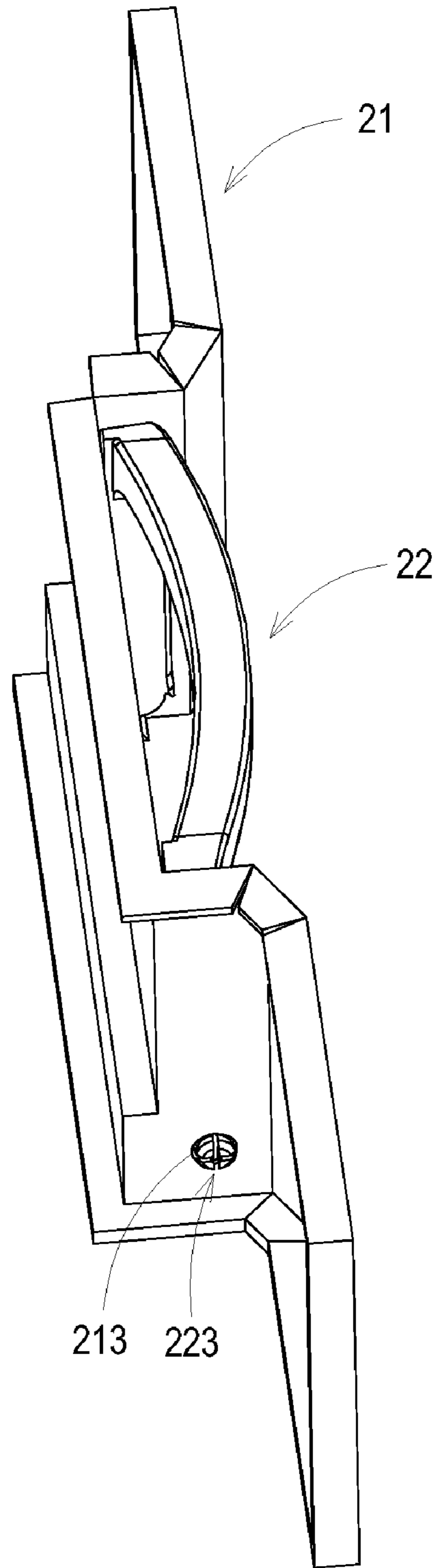


FIG. 4

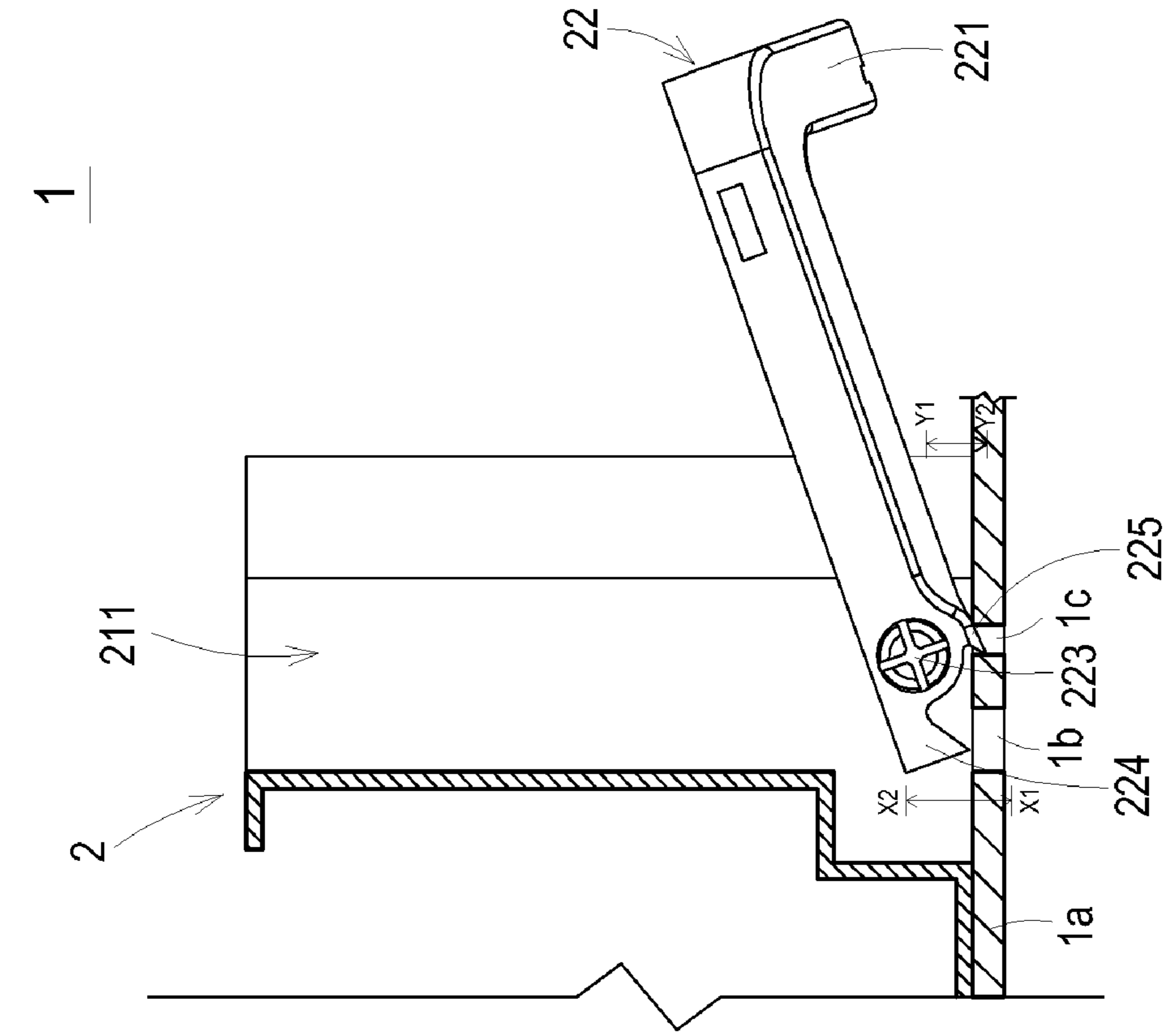


FIG. 5A

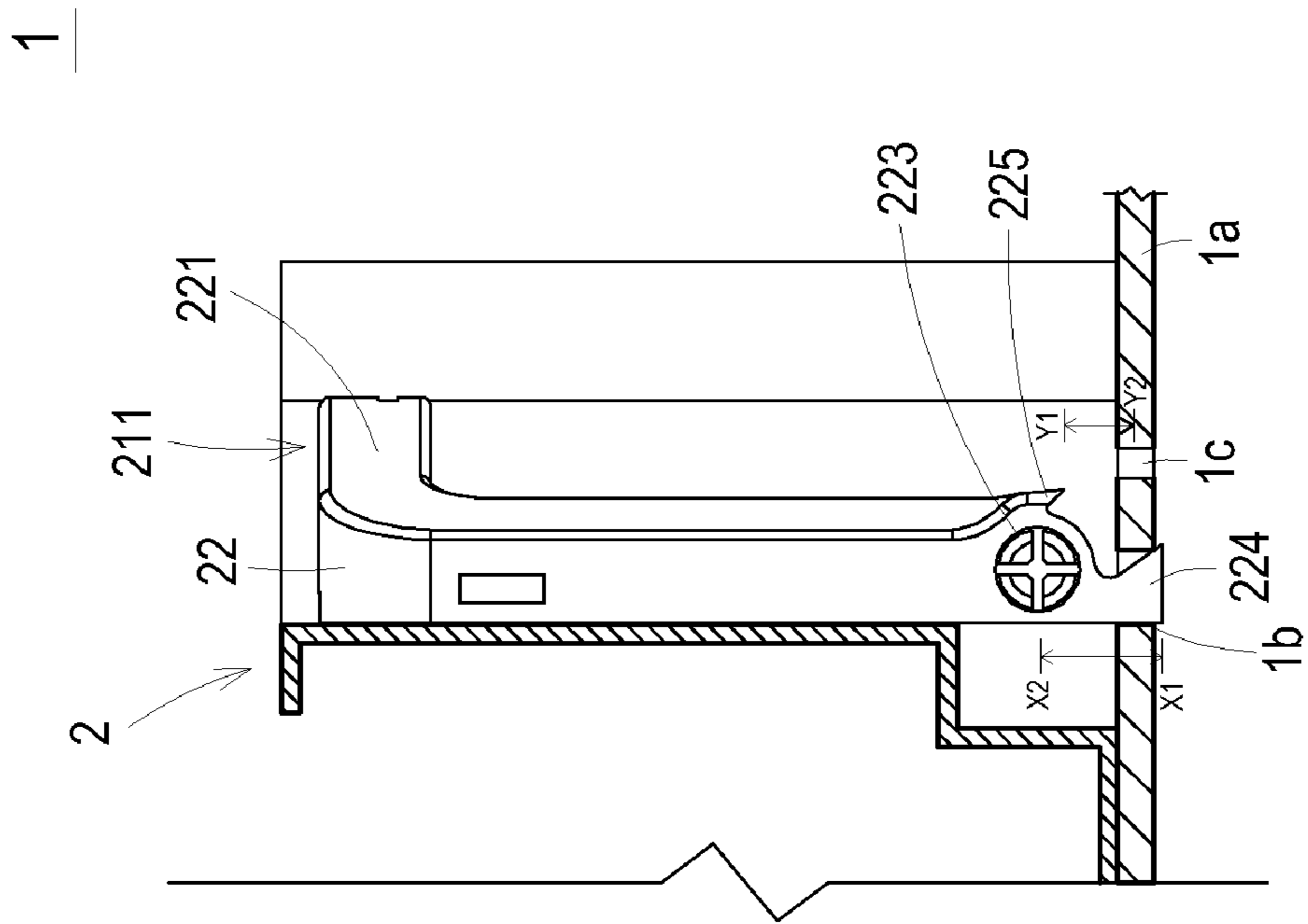


FIG. 5B

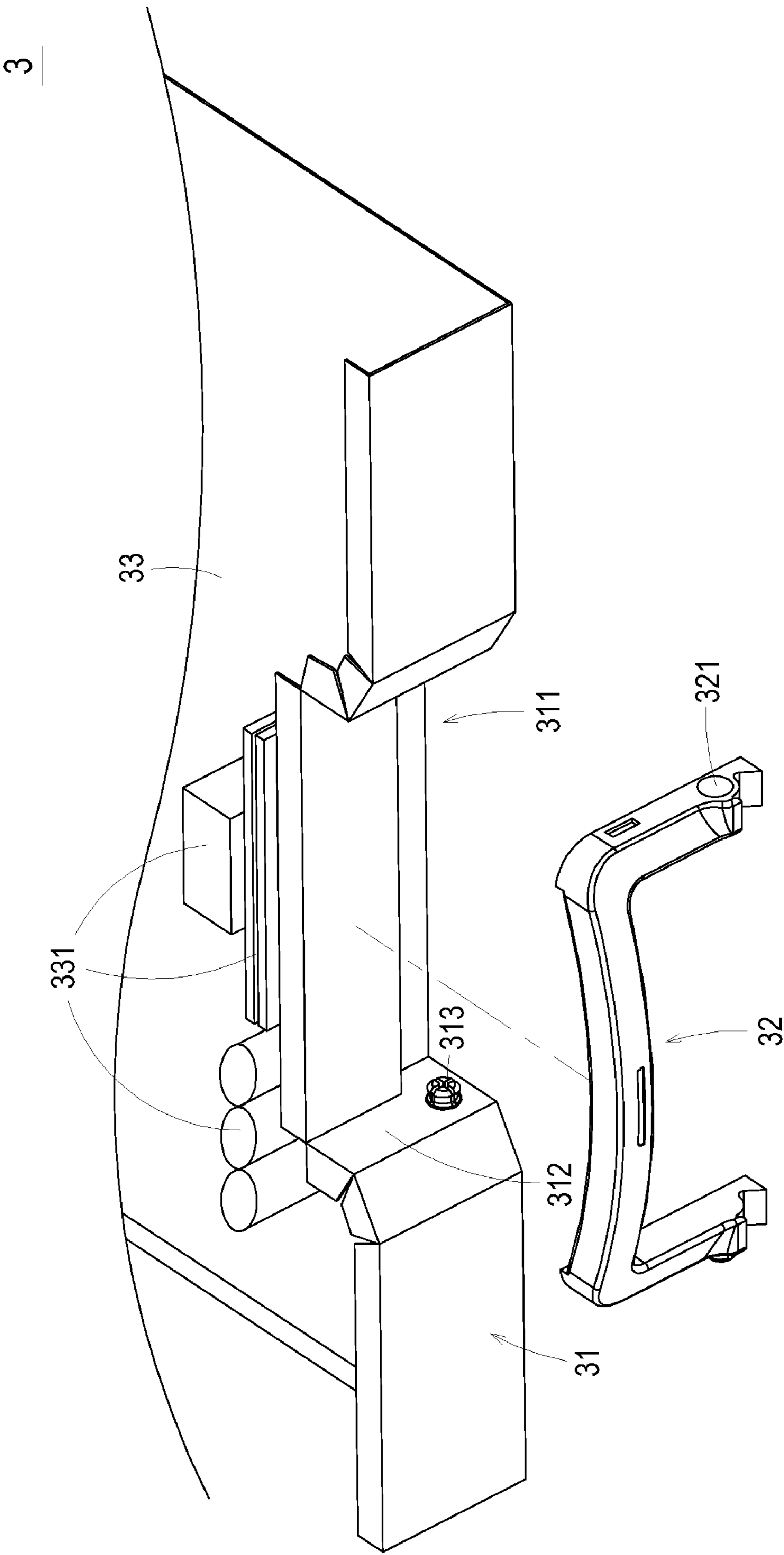


FIG. 6

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REMOVABLE ELECTRONIC DEVICE WITH HANDLE STRUCTURE

FIELD OF THE INVENTION

The present invention is related to a removable electronic device, and more particularly to a removable electronic device with handle structure.

BACKGROUND OF THE INVENTION

Nowadays, the removable electronic devices, such as, removable power supplier or removable hard disk, are widely applied to many systems, e.g., industrial computer, server, disk array and communication apparatus, for providing sufficient and consistent power or sufficient and manageable data storage, and in the meantime, also convincing the inconvenience arisen as frequently exchanging the power supplier or hard disk, so that the user can experience the convenience of rapid exchange and hot swap.

Take the removable power supplier as example. Generally, for facilitating the exchange of the removable power supplier, a structure similar to the handle will be mounted on the housing of the removable power supplier, so as to provide the user a convenient pulling operation. Please refer to FIG. 1, which is a schematic view showing the removable power supplier with fixed handle structure in the prior art. As shown, the traditional removable power supplier **10** includes a housing **11** and a fixed handle structure **12**, wherein the housing **11** is provided with a printed circuit board (not shown), and the fixed handle structure **12** is fixed on two opposite side walls **13** of the housing **11**, so as to facilitate a convenient pulling out operation for the user as exchanging the removable power supplier **10**.

However, since the fixed handle structure **12** is fixedly mounted on the housing **11** of the power supplier **10** in a protruded state, it is difficult to avoid the idle handle structure **12** from accident collision or pulling and therefore the removable power supplier from being moved at the same time. Besides, the protruded handle structure **12**, in addition to occupying space, also influences the integrity of appearance.

Therefore, how to develop a removable electronic device with handle structure which can effectively reduce the extra volume caused from the protruded handle structure and can provide a handle structure with appearance integrity and detaching capability is really an urgent demand.

SUMMARY OF THE INVENTION

The object of the present invention is to provide a removable electronic device with handle structure, in which through an engagement between an elastic engaging device and an engaging component, the handle structure can be pivotally mounted on an accommodating trough formed on the housing of the removable electronic device, so that the occupied space of the handle structure can be saved as idle, and the handle structure also can be rotated out of the accommodating trough by taking the elastic engaging device as an axle center when the user tries to utilize the handle structure to pull out the accommodating through, thereby solving the problem that the conventional handle structure which is directly fixed and protruded on the housing occupies too much space and spoils appearance integrity.

For achieving the object described above, one aspect of the present invention provides a removable electronic device with handle structure suitable for an electronic apparatus including a housing having an accommodating trough, a

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handle structure, an elastic engaging device, and an engaging component corresponding to the elastic engaging device, wherein the handle structure is pivotally mounted on and received in the accommodating trough through an engagement between the elastic engaging device and the engaging component.

For achieving the object described above, another aspect of the present invention provides an electronic apparatus including a removable electronic device with handle structure. The removable electronic device includes a housing having an accommodating trough, a handle structure, an elastic engaging device, and an engaging component corresponding to the elastic engaging device, wherein the handle structure is pivotally mounted on and received in the accommodating trough through an engagement between the elastic engaging device and the engaging component.

The above contents of the present invention will become more readily apparent to those ordinarily skilled in the art after reviewing the following detailed description and accompanying drawings, in which:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic view showing the removable power supplier with fixed handle structure in the prior art;

FIG. 2 is a schematic view showing the removable power supplier with handle structure in a first embodiment according to the present invention;

FIG. 3 is a sectional view showing the assembling relationship of the elastic engaging device and the engaging component of FIG. 2;

FIG. 4 is a sectional view showing the assembling relationship of the handle structure and the housing of FIG. 2;

FIG. 5A is a sectional view showing the handle structure of FIG. 2 received by the accommodating trough of the housing;

FIG. 5B is a sectional view showing the handle structure of FIG. 5A rotated and pulled out of the accommodating trough of the housing; and

FIG. 6 is a schematic view showing the removable power supplier with handle structure in a second preferred embodiment according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention will now be described more specifically with reference to the following embodiments. It is to be noted that the following descriptions of preferred embodiments of this invention are presented herein for purpose of illustration and description only. It is not intended to be exhaustive or to be limited to the precise form disclosed.

The present invention is related to a removable electronic device with handle structure. The removable electronic device is mounted in an electronic apparatus, such as, a computer, but not limited thereto. The embodiment described below is based on the removable power supplier, but it should be appreciated that the removable electronic device of the present invention is not only limited to the power supplier but can be implemented as any removable electronic device provided with the following features, such as removable hard disk.

Please refer to FIG. 2, which is a schematic view showing the removable power supplier with handle structure in a first embodiment according to the present invention. As shown, the removable power supplier **2** includes a housing **21** and a handle structure **22**, wherein the housing **21** has a printed circuit board **23** mounted therein, and the printed circuit

board **23** bears plural electronic elements **231** thereon. The housing **21** is formed to have an inwardly recessed accommodating trough **211** for receiving the idle handle structure. Moreover, the accommodating trough **211** further includes two opposite side walls **212**, and the side walls **212** respectively have an engaging component corresponding to each other. In this embodiment, the engaging elements are implemented to be through holes **213**, but not limited thereto.

Further refer to FIG. 2. In this embodiment, the handle structure **22** is implemented to have a Π shape which is composed of a holding portion **221** and two symmetrical connecting portions **222**, and which can be made of elastic material, but not limited thereto. The two connecting portions **222** respectively have an elastic engaging device corresponding to the engaging components on the side walls. In this embodiment, the elastic engaging device is implemented to be, but not limited, a bulge **223** which can be integrally formed with the handle structure, but not limited thereto. Moreover, the ends of the connecting portions **222** respectively have a first position-limiting portion **224** and a second position-limiting portion **225**, for respectively engaging with a first positioning hole **1b** and a second positioning hole **1c** on the housing **1a** of an electronic apparatus **1** (as shown in FIG. 5A), so as to restrict the movement of the handle structure **22**.

Please refer to FIG. 3, which is a sectional view showing the assembling relationship of the elastic engaging device and the engaging component of FIG. 2. As shown, the bulge **223** is constituted by a top portion **223a**, a spool portion **223b** and at least a slot **223c**, wherein the top portion **223a** includes an upper surface **223d** and inclined planes **223e**, which are connected to the upper surface **223d**, and the width of the top portion **223a** is substantially larger than that of the spool portion **223b**. Furthermore, the slot **223c** is formed to run through the top portion **223a** and the spool portion **223b** of the bulge **223** and have a width of d . In this embodiment, the bulge **223** is formed to have crossed slots **223c** (as shown in FIG. 2), and in other embodiments, it also can be implemented as single slot **223c**, but not limited thereto, and can be varied according to different practical situations.

Please refer to FIG. 2, FIG. 3 and FIG. 4. When trying to mount the handle structure **22** onto the housing **21** of the removable power supplier **2**, the bulges **223** of the handle structure **22** will be aimed at the through holes **213**, and then the handle structure **22** is horizontally pushed into the accommodating trough **211**. Here, since the handle structure **22** is made of elastic material, when the handle structure **22** is contacted with the side walls **212** and forced to move forward, the connecting portions **222** will produce a transformation owing to the rejection by the side walls **212** for facilitating the entry of the handle structure **22** into the accommodating trough **211** and also the bulges **223** into the corresponding through holes **213**. At this time, the upper surface **223d** of the bulge **223** will reject to the edge **213a** of the through hole **213** and through the guiding of the inclined planes **223e**, the top portion **223a** of the bulge **223** can smoothly slide into the through hole **213**. Moreover, during the entry process, since the adjustable width d of the slot **223c** provides an adjusting space, when the inclined planes **223e** suffer the force from the edges **213a**, the top portion **223a** can be transformed to reduce the volume thereof, so as to facilitate the top portion **223a** of the bulge **223** to pass through the through hole **213**. Then, after the top portion **223a** passes through the through hole **213**, because the force on the upper surface **223d** and the inclined planes **223e** disappears, the elastic recoverability provided by the material of the bulge **223** can restore the width d of the slot **223c**, so that the bulge **223** will outwardly expand to regain the original shape. Then, the bottom surface

223g of the top portion **223a** will reject to the inner surfaces **212a** of the side wall **212**, and the spool portion **223b** of the bulge **223** will engage in the through hole **213**, so that a mutual engagement between the bulge **223** and the through hole **213** is achieved, and thus, the handle structure **22** is engaged with the housing **21** of the removable power supplier **2**.

Please refer to FIG. 5A, which is a sectional view showing the handle structure of FIG. 2 received by the accommodating trough of the housing. As shown, the removable power supplier **2** is located in the electronic apparatus **1** and on a bottom plane **1a**, which includes a first positioning hole **1b** and a second positioning hole **1c**. When the handle structure **22** is received by the accommodating trough **211** of the housing **21**, the first position-limiting portion **224** of the handle structure **22** is located at a first position X1 and the second position-limiting portion **225** is located at a third position Y1, and further, the first position-limiting portion **224** passes through and engages with the first positioning hole **1b** on the bottom plane **1a**, thereby limiting the handle structure **11** in the accommodating trough **211**. Accordingly, when the handle structure **22** is idle, it can be stored in the accommodating trough **211** to save occupied space and also provide appearance integrity.

Please refer to FIG. 5B, which is a sectional view showing the handle structure of FIG. 5A rotated and pulled out of the accommodating trough of the housing. As shown, when the user holds the holding portion **211** for rotating the handle structure to pull out, the handle structure **22** is rotated by taking the bulges **223** as an axle center, and after rotation, the handle structure **22** is exposed out of the accommodating trough **211**. During the rotation, the first position-limiting portion **224** moves upwardly from the first position X1 to the second position X2 and separates from the first positioning hole **1b**, and the second position-limiting portion **225** moves downwardly from the third position Y1 to a fourth position Y2 and passes through and engages with the second positioning hole **1c** on the bottom plane **1a**. Through the engagement between the second position-limiting portion **225** and the second positioning hole **1c**, the downward rotation of the handle structure can be limited, so as to restrict the handle structure at an upward inclined state, which helps the user to pull out the removable power supplier **2**.

Please refer to FIG. 6, which is a schematic view showing the removable power supplier with handle structure in a second preferred embodiment according to the present invention. As shown, the removable power supplier **3** with handle structure includes a housing **31** and a handle structure **32**, wherein the housing **31** has a printed circuit board **33** mounted therein which bears plural electronic elements **331** thereon, and the housing **31** includes an accommodating trough **311** and side walls **312**. In this embodiment, the structures and assembling manner of the housing **31**, the printed circuit board **33**, the electronic elements **331**, the accommodating trough **311**, the side walls **312** and the handle structure **32** are identical to the embodiment described above, and are omitted. Particularly, in this embodiment, the elastic engaging devices **313** are mounted on the housing **31** and the corresponding engaging components **321** are mounted on the handle structure **32**. But, it should be understood that the positions of the elastic engaging devices and the engaging components can be varied according to different demands without limitation. Besides, in this embodiment, the housing **31** can be made of elastic material for providing flexibility or metal material without flexibility, but not limited thereto.

In the aforesaid, the present invention provides a removable electronic device with handle structure which is suitable

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for an electronic apparatus. Through an engagement between the elastic engaging devices and the engaging components, the handle structure can be pivotally mounted on the accommodating trough formed on the housing of the removable electronic device, so that the occupied space of the handle structure can be saved as idle, and the handle structure also can be rotated out of the accommodating trough by taking the elastic engaging devices as an axle center when the user tries to utilize the handle structure to pull out the removable electronic device. Therefore, not only the occupied space can be saved, the appearance integrity and practicability are also presented.

While the invention has been described in terms of what is presently considered to be the most practical and preferred embodiments, it is to be understood that the invention needs not be limited to the disclosed embodiment. On the contrary, it is intended to cover various modifications and similar arrangements included within the spirit and scope of the appended claims which are to be accorded with the broadest interpretation so as to encompass all such modifications and similar structures.

What is claimed is:

1. A removable electronic device with handle structure suitable for an electronic apparatus, comprising: a housing, having an accommodating trough; a handle structure; an elastic engaging device; and an engaging component, corresponding to the elastic engaging device, wherein the handle structure is rotated by taking the elastic engaging device as an axle center, and the handle structure is pivotally mounted on and received in the accommodating trough through an engagement between the elastic engaging device and the engaging component, and the handle structure further comprises a first position-limiting portion and a second position-limiting portion for respectively engaging with a first positioning hole and a second positioning hole formed on a bottom plane of the electronic apparatus, so as to limit the movement of the handle structure.

2. The device as claimed in claim 1, wherein the elastic engaging device is mounted on the handle structure and the engaging component is mounted on the housing.

3. The device as claimed in claim 1, wherein the elastic engaging device is a bulge.

4. The device as claimed in claim 3, wherein the engaging component is a trough hole corresponding to the bulge.

5. The device as claimed in claim 4, wherein the bulge further comprises a top portion, a spool portion and at least a slot, which penetrates through the top portion and the spool portion.

6. The device as claimed in claim 5, wherein the top portion further comprises an upper surface and an inclined plane connected with the upper surface.

7. The device as claimed in claim 6, wherein during an engagement of the bulge and the through hole, the upper surface of the top portion rejects to an edge of the through hole first, the inclined plane guides the top portions to slide into the through hole, and the edge compresses the inclined plane and narrows the slot, so as to pass the top portion through the through hole, and after passing through the through hole, a bottom surface of the top portion rejects to an inner surface of the side wall and the spool portion fixedly positions in the through hole, so as to engage the handle structure with the housing.

8. The device as claimed in claim 1, wherein the elastic engaging device is mounted on the housing and the engaging component is mounted on the handle structure.

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9. The device as claimed in claim 1, wherein when the handle structure is received in the accommodating trough of the removable electronic device, the first position-limiting portion of the handle structure is located at a first position and the second position-limiting portion is located at a third position, and further, the first position-limiting portion passes through and engages with the first positioning hole, thereby limiting the handle structure in the accommodating trough.

10. The device as claimed in claim 9, wherein for pulling the handle structure out of the accommodating trough of the removable electronic device, at first, the handle structure is rotated by taking the elastic engaging device as an axle center, and during the rotation, the first position-limiting portion moves upwardly from the first position to the second position and separates from the first positioning hole, and the second position-limiting portion moves downwardly from the third position to a fourth position and passes through and engages with the second positioning hole on the bottom plane, so as to restrict the movement of the handle structure and fix the handle structure at an inclined state.

11. An electronic apparatus, comprising: a removable electronic device with handle structure suitable, comprising: a housing, having an accommodating trough; a handle structure; an elastic engaging device; and an engaging component, corresponding to the elastic engaging device, wherein the handle structure is rotated by taking the elastic engaging device as an axle center, and the handle structure is pivotally mounted on and received in the accommodating trough through an engagement between the elastic engaging device and the engaging component, and the handle structure further comprises a first position-limiting portion and a second position-limiting portion for respectively engaging with a first positioning hole and a second positioning hole formed on a bottom plane of the electronic apparatus, so as to limit the movement of the handle structure.

12. The electronic apparatus as claimed in claim 11, wherein the elastic engaging device is mounted on the handle structure and the engaging component is mounted on the housing.

13. The electronic apparatus as claimed in claim 11, wherein the elastic engaging device is a bulge.

14. The electronic apparatus as claimed in claim 13, wherein the engaging component is a trough hole corresponding to the bulge.

15. The electronic apparatus as claimed in claim 14, wherein the bulge further comprises a top portion, a spool portion and at least a slot, which penetrates through the top portion and the spool portion.

16. The electronic apparatus as claimed in claim 15, wherein the top portion further comprises an upper surface and an inclined plane connected with the upper surface.

17. The electronic apparatus as claimed in claim 11, wherein the elastic engaging device is mounted on the housing and the engaging component is mounted on the handle structure.

18. The electronic apparatus as claimed in claim 12, wherein when the handle structure is received in the accommodating trough of the removable electronic device, the first position-limiting portion of the handle structure is located at a first position and the second position-limiting portion is located at a third position, and further, the first position-limiting portion passes through and engages with the first positioning hole, thereby limiting the handle structure in the accommodating trough.